UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

OYSTER OPTICS, LLC, *Plaintiff,* *v.*		
CORIANT AMERICA INC. ET AL.,		2:16-cv-01302-JRG-RSP LEAD CASE
INFINERA CORPORATION,		2:16-cv-01295-JRG-RSP
ALCATEL-LUCENT USA INC.,		2:16-cv-01297-JRG-RSP
FUJITSU NETWORK COMMUNICATIONS, INC.,		2:16-cv-01299-JRG-RSP
CISCO SYSTEMS, INC. ET AL.,		2:16-cv-01301-JRG-RSP
HUAWEI TECHNOLOGIES CO., LTD. ET AL.,		2:16-cv-01303-JRG-RSP
CIENA CORPORATION		2:17-cv-00511-JRG-RSP

Defendants.

DECLARATION OF MICHAEL LEBBY, Ph.D., D. Eng.

I, Michael Lebby, Ph.D., D. Eng., declare and state as follows:

I. INTRODUCTION

1. I have been retained as an expert in the above captioned cases by Oyster Optics, LLC. I understand that Oyster Optics, LLC has asserted eight patents in these cases: U.S. Patent Nos. 6,469,816 (the "'816 patent"); 6,476,952 (the "'952 patent"); 6,594,055 (the "'055 patent"); 7,099,592 (the "'592 patent"); 7,620,327 (the "'327 patent"); 8,374,511 (the "'511 patent"); 8,913,898 (the "'898 patent"); and 9,363,012 (the "'012 patent"). I understand that these patents are involved in claim construction proceedings.

2. I have been asked to consider and opine on claim constructions for disputed claim terms, which I set forth below in separate sections for each term.

3. In forming my opinions, I have reviewed, considered, and/or had access to patent specifications and claims, their prosecution histories, the parties' joint claim construction charts, and materials cited in those charts. I have also relied on my professional and academic experience in the field of optical telecommunications networks and systems. I reserve the right to consider additional materials as I become aware of them and to revise my opinions accordingly.

II. QUALIFICATIONS

4. I received a bachelor's degree in electrical engineering, with honors, from the University of Bradford, United Kingdom, in 1984. I went on to obtain an M.B.A. from the same university in 1985 and, two years later, earned my Ph.D. there using research experience while working at AT&T Bell Laboratories in New Jersey. In 2004, I received a doctor of engineering degree, which is a higher doctorate, also from the University of Bradford.

5. I have been the Chief Executive Officer (CEO) and Chief Technology Officer (CTO) of Oculi LLC, which provides international board level advisory, consulting,

technological, and business-based services in the optoelectronics, semiconductor, and telecommunications industries, since 2003. This is my consulting company through which I undertake my litigation expert witness work.

6. In 2015, I became a Director of Lightwave Logic to assist the company with developing optical modulator products and their associated packaging, manufacturing, and marketing. On May 1, 2017, I was elected to serve as Lightwave Logic's CEO in addition to my Board Director position.

7. From 2014–2016, I was a Director for Corporate and Foundation Relations with the University of Southern California. In this position, I helped the University foster relationships with semiconductor, photonics, and electronics companies in the San Francisco area.

8. From 2013–2015, I was a Professor of Optoelectronics as well as the Chair of Optoelectronics at Glyndŵr University in Wales, United Kingdom. My areas of focus included the design, simulation, and testing of photonic integrated circuits and optoelectronics integrated circuits. I am now in the process of being elected a visiting professor at the University.

9. Since 2013, I have been a technical expert for the Photonics Unit of the European Commission, participating in arranging workshops and lectures, evaluating photonics proposals, and advising on the Commission's pilot programs in photonics.

10. Since 2013, I have served as the President and CEO of OneChip Photonics Corporation, which is in the process of winding down and is expected to completely wind down by the end of 2017. The original focus of the company was on technical and business operations strategies for fiber communications-based InP Photonic Integrated Circuit and optoelectronic Integrated Circuit (IC) platforms. OneChip manufactured products for the PON (Passive Optical

Network) market and focused on FTTx (Fiber To The X – curb, premise, home etc.) applications with products that adhered to and met international standards. OneChip also was sampling 25Gbps high speed data rate components for the short distance (<10km) optical networking markets. OneChip was designing 50Gbps prototypes before the company ceased development operations in 2014. Before becoming President and CEO, I was an elected independent Member of the Board of OneChip Photonics Corporation since 2008, with a similar focus.

11. From 2010–2013, I was the General Manager and CTO at Translucent, Inc., where I led efforts to develop technological platforms that have the potential to impact the markets for fiber communications, power electronics, light emitting diode (LED) lighting, concentrator photovoltaics (CPV) solar technology, and high speed electronics.

12. From 2005 through early 2010, I was the President, CEO, and a Member of the Board for the Optoelectronic Industry Development Association (OIDA), a non-profit industry trade association for optoelectronics/photonics and a national resource in the field of optoelectronics. OIDA centered much of its activities in fiber communications that dealt with the complete value chain from materials and devices up to networks and social media/content providers. During my tenure at OIDA, OIDA did not participate in standards settings, like other trade associations, as the fiber optic communications industry was already well supplied with organizations such as OIF, IEEE, ANSI etc. While OIDA did not set standards, OIDA was aware of standards activity and regularly invited speakers who participated in standards activity to OIDA workshops and conferences, so that technical updates could be reported publicly to the industry.

13. I am an expert in the fields of optoelectronics, electronics, semiconductors, fiber optics, and electrically and optically based designs that include typical standards protocols.

Optoelectronics is the study and application of devices that source, detect, control, and display light. I have design experience with optics, optical sources (such as lasers, LEDs, and receivers (such as photodetectors, solar cells, and image sensors)). I have also designed optical transceivers, be they with fiber optics, semiconductor waveguides, polymer waveguides, dielectric waveguides, etc. The transceivers all utilized microcontrollers that needed to be programmed before operation. The transceivers were interoperable with a number of protocols, including Ethernet, SONET, Fibre Channel, FDDI, ESCON, SFF, SFP etc. While employed at Motorola, AMP, Ignis Optics, and Intel, I participated in HPPI, SFP, XPAK. XENPAK, XFP and other related standards meetings that were worked upon by IEEE and OIF.

14. I have also designed electrical and optical interconnects, typically on PCBs (printed circuit boards), plastics or polymers, and semiconductor platforms. I have also designed RF and microwave circuits for various substrate platforms and designed optimum ways to communicate to those platforms. I have also designed packages that are essentially boxes that surround the electrical and optical devices and allow interconnection from the outside world down to the chip level. In many of these designs, the transceivers (which are essentially the boxes that contain the components) are software programmable. I have also designed displays that comprise optical technologies such as LEDs and liquid crystal display (LCD) material. In these cases, some of the displays can be removable or disconnected electrically. Many of these displays were designed at Motorola for use in mobile products such as cell phones and consumer items such as electronic books, pagers, and headsets or spectacles. I also have significant experience with the testing and evaluation of semiconductors and optoelectronics, including fiber optic communications, LEDs, materials, packaging, and alignment. Notably, many of the optical and electrical designs were prototyped for manufacturing.

15. I have authored numerous publications on topics in the fields of optoelectronics and photonics. My curriculum vitae, attached to this declaration, lists these publications and sets forth further detail on my education and work experience.

III. LEVEL OF ORDINARY SKILL IN THE ART

16. In my opinion, a person of ordinary skill in the relevant art ("POSITA") would be a person with a bachelor's degree in electrical or electronic engineering with approximately 3-5 years of experience in optical telecommunications networks and systems, or a postgraduate degree such as a master's degree in electrical or electronic engineering with approximately 1-2 years of experience in optical telecommunications networks and systems, or a doctorate or higher postgraduate degree in electrical or electronic engineering with experience in optical telecommunications networks and systems through relevant research or graduate work.

IV. BACKGROUND

17. The patents-in-suit concern telecommunications networks and systems, and in particular fiber optic networks. Telecommunications networks are used for communications from one point to another over an extended distance. (M. Weik, FIBER OPTICS STANDARD DICTIONARY, (Chapman & Hall 3rd ed. 1997) ("Weik"), at 1007 ("telecommunications system: A system at (a) is used for communications among points separated by distances so great that extended communications facilities or systems are required, … (c) may be composed of several communications systems or networks, such as fiber optic nets ….").

18. Fiber optic networks have transceivers at the various locations in a telecommunications network and are connected with fiber optic cables. Transceivers are usually small boxes where optical signals are sourced and received. The word transceiver means both transmit and receive - so the function of a transceiver common to POSITAs is a box (or module) that sends out optical signals, and can independently receive optical signals.

19. Transceivers can come in many different physical shapes and sizes. Typically, transceivers have one fiber for output (i.e. taking the source optical signal off the transceiver and down the fiber), and one fiber for input (i.e. taking the input optical signal from a transmitter in a different location and conveying that optical signal to the photodetector inside the transceiver box).

20. Transceivers first were used for data communications in the late 1970s where the cost of the optics was needed to be reduced significantly. Telecom utilized transmitters and receivers i.e. in this case each transmitter had its own package or module, and each receiver similarly.

21. By the late 1970s there was a drive to reduce interconnect costs including both size weight and power. Miniaturization is still in force today in the transceivers, but also in the early 1980s where there was a drive to put both the transmitter and receiver into the same box or module. In these modules both the transmitter function with laser was co-packaged with a receiver function with a photodetector.

22. A transceiver has an output for fiber which conveys the optical signal off of the transceiver. This signal is designed to travel a certain distance to a receiver typically placed at a different location. This location could be in another board on the same rack, or on a different rack, or simply a different communications system either in the building or located geographically elsewhere. Either way, the optical signal leaves the transmitter and heads to another transceiver as the receive, input optical signal. Depending on the fiber distance, fiber type, and other physical conditions the received signal may deteriorate along the way. If the signal has not deteriorated much then it can be interpreted by the receiver and the information conveyed. Optical systems are designed to operate with extremely low bit error rates i.e. they do

not lose much information in terms of bits on the way. The transceiver sending the optical signal is also capable of receiving an optical signal from another transceiver at some other location, be it geographic, different board, different rack or different system.

23. In total over the last 30 or so years, there have been cumulatively approximately 100 million transceiver units manufactured and placed into service into optical networks. The vast majority of the volume is data communications driven, and transceivers have been a staple and common component of an optical networking system for the past three decades.

V. <u>"Phase Modulate" and Grammatical Variations</u> ('816 claims 1, 7, 12, 19; '055 claims 1, 7, 14, 15, 17, 27; '952 claims 1, 4, 5, 12, 13, 14; '592 claims 1, 5, 10, 13, 14; '327 claims 4, 10, 14, 16, 17, 25, 27, 28, 37; '511 claim 9; '898 claims 4, 10, 18; '012 claims 9, 11)

24. In order to understand "phase modulate" and related terms, it is important to understand the concept and practice of modulation in optical communications systems, such as the systems described and claimed in the asserted patents. Any optical communications system communicates data by modulating light, which is a form of electromagnetic wave. A continuous light wave is defined by certain characteristics, including its amplitude, frequency, and phase. (G. Agrawal, FIBER-OPTIC COMMUNICATION SYSTEMS, (John Wiley & Sons, Inc. 2d ed. 1997) ("Agrawal"), at 14.) Modulation is the process of encoding the data that is to be communicated in the light wave, by changing one or more of the characteristics of the light wave as a representation of the data. (Agrawal at 14; M. Weik, FIBER OPTICS STANDARD DICTIONARY, (Chapman & Hall 3rd ed. 1997) ("Weik"), at 601-602.)

25. For example, data can be transmitted by modulating the amplitude, using one value of amplitude to transmit a binary value of 0 and a second value of amplitude to transmit a binary value of 1. (Agrawal at 244-246.) Or as another example, data can be transmitted by

modulating the phase, using one value of the phase angle to transmit a binary value of 0 and a second value of the phase angle to transmit a binary value of 1. (Agrawal at 246-247.)

26. To transmit data at a higher rate, it is desirable to be able to transmit more than a single binary bit at a time. This can be done by selecting from four possible values of amplitude or four possible values of phase, rather than from two values, and thus transmitting two bits of data at a time. It was known in the art that in order to further increase the number of bits being sent at a time, it was possible to modulate both the amplitude and the phase of the light wave in a coordinated manner.

27. "Phase modulation" and its grammatical variations ("phase modulate," "phase modulating," "phase modulator," and "phase modulated") were common terms used in the field of optical communications at the time of the invention of the asserted patents. They have (and had at the time of the invention) a plain and ordinary meaning of altering the phase of light to create an optical signal having a phase that is representative of data. Nothing in this plain and ordinary meaning excludes the possibility of modulating or otherwise changing other characteristics of the light wave while the phase modulation is occurring. The dictionary definitions of "phase modulation" reflect and are entirely consistent with this plain and ordinary meaning. (M. Weik, FIBER OPTICS STANDARD DICTIONARY, (Chapman & Hall 3rd ed. 1997), at 742; THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS, Seventh Ed. (2000) at 816.)

28. The asserted patents' use of these terms is no different from the plain and ordinary meaning. Nowhere do any of the patents or their file histories offer a different definition of these terms or act as a lexicographer for these terms. Nowhere do the patents or their file histories disclaim any part of the plain and ordinary meaning of these terms.

29. Certain of the asserted patents refer to a "phase-modulated mode," where "the amplitude of the optical signal is constant," i.e. where phase modulation and only phase modulation is used, but in the same paragraph these patents also expressly state that other forms of modulation can be used. ('898 patent col. 4.) The asserted patents expressly contemplate that the amplitude as well as the phase of the optical signal can be modified. For example, Figure 1 of the '816, '055, '952, and '592 patents, and Figure 2 of the '327, '511, '898, and '012 patents each show a controller **18** that is connected to a laser **12** and "modulator" or "phase modulator" **16**. The controller controls the modulator and also controls the power output of the laser. (E.g., '816 patent col. 3.) As a matter of basic physics and as one skilled in the art would recognize, if the power of a light wave changes, so does its amplitude. (See '816 patent col. 4.)

30. The claims also use "phase modulation" in a way that is consistent with the plain and ordinary meaning to those skilled in the art. For example, claim 6 of the '816 patent is a dependent claim that depends upon claim 1. Claim 6 adds the requirement that "an amplitude of the phase-modulated optical signal is constant." I understand that under the doctrine of claim differentiation, there is a strong presumption that claim 6 has a different scope than its parent claim 1. This means that the "phase-modulated optical signal" in claim 1 need not have a constant amplitude, consistent with the plain and ordinary meaning of "phase modulated."

31. Claim 12 of the '816 patent contains the step of "monitoring an energy level of the phase-modulated optical data stream." As explained above, the energy of the light wave depends upon its amplitude, meaning that a constant amplitude light wave would have a constant energy. (See '816 patent col. 4.) It would not make sense to "monitor the energy level" of a phase-modulated optical data stream, if a phase-modulated signal necessarily had a constant amplitude—and thus a constant energy level—as defendants contend.

32. Similar to claim 6 of the ‘816 patent, claims 1, 15, 17, and 27 of the ‘055 patent each require “the phase-modulated optical signal [at the optical output being / from the transmitter] free of amplitude modulation as a function of the input electronic data stream.” It would be redundant and make no sense to require that the phase-modulated optical signal be “free of amplitude modulation,” if the term “phase-modulated” required a constant amplitude, as defendants contend.

33. As explained above, the intrinsic and extrinsic evidence is all consistent with the plain and ordinary meaning of “phase modulation” and the related terms. However, if an explicit construction of these terms consistent with the intrinsic and extrinsic record were required, it is my opinion that a construction of “alter the phase of light to create an optical signal having a phase that is representative of data” is accurate. In my opinion, it would be inconsistent with the plain and ordinary meaning of the term and inconsistent with the intrinsic and extrinsic record to require that the amplitude of the light be constant.

VI. “Energy Level Detector”
(‘816 claims 19, 20; ‘592 claims 3, 17; ‘898 claims 1, 14)

34. To one skilled in the art at the time of the invention of the asserted patents, the term “energy level detector” had a straightforward plain and ordinary meaning: a device to measure optical power. One skilled in the art would not have understood the term to be limited to devices for “optical tap detection” as the defendants suggest.

35. Nowhere do the patents or their file histories offer a specific definition of “energy level detector” or act as a lexicographer for that term. Nowhere do the patents or their file histories disclaim other types of energy level detectors that serve purposes other than tap detection. To the contrary, the ‘327, ‘511, and ‘898 patents each describe an energy level detector **33** in Figure 3. Each patent identifies detection of “a potential optical tap” as just one

purpose that the energy level detector "may be configured" for, along with detection of "excess light" or of "other degradation of the optical signal." And, each patent explains that this energy level detector in Figure 3 is just "a preferred analog implementation, with other implementation circuits possible." One skilled in the art would understand that the specifications of the '327, '511, and '898 patents expressly permit energy level detectors that do not detect taps but that have other purposes. One skilled in the art would understand that energy level detectors provide benefits and advancements in reliability, speed, and security for the fiber optic systems in which they are incorporated.

36. The claims of the asserted patents further confirm that an "energy level detector" need not be for tap detection. In the '816 patent, claim 19 requires "an energy level detector detecting an energy level of the phase-modulated optical signal in the optical fiber," while claim 5 requires "a tap detection monitor monitoring an amplitude of the phase-modulated information optical signal." I understand that because one claim uses the term "energy level detector" and another otherwise similar claim uses the term "tap detection monitor," there is a presumption that the two terms mean different things and thus that—consistent with its plain and ordinary meaning—an "energy level detector" need not exist for the purpose of "tap detection."

VII. "Receiver"
('327 claims 1, 14, 25, 36; '511 claims 1, 9; '898 claims 1, 14)

37. To one skilled in the art at the time of the invention of the asserted patents, the term "receiver" was a well-known word with a straightforward plain and ordinary meaning. Nowhere do the patents or their file histories offer a specific definition of "receiver" or act as a lexicographer for that term. Nowhere do the patents or their file histories disclaim the use of any particular type of "receiver."

38. One skilled in the art will recognize that the precise components that make up the receiver will differ, depending upon the types of modulation that are used and upon the choices made by the designer of the receiver. Various types of receivers are described in the asserted patents, for example. (E.g., '055 patent cols. 1, 3, 5; '898 patent cols. 4, 5.)

39. One of defendants' proposed constructions for "receiver" is "receiver, excluding receivers that include a demodulator to demodulate the optical signal to produce output data." The proposal appears to be based upon an office action rejecting the pending claims of the '898 patent on the basis of enablement and a subsequent amendment that removed the requirement that the receiver "hav[e] a demodulator." ('898 Patent File History, Office Non-Final Rejection June 26, 2013; '898 Patent File History, Response to Non-Final Office Action October 21, 2013.)

40. To the extent that defendants' second proposed construction is meant to exclude transceiver cards that contain a demodulator from the scope of the asserted claims, this construction is inconsistent with the claims, as understood by one skilled in the art, in light of the '898 patent file history. The specification and the claims of the '327, '511, and '898 patents each contain a "modulator" that modulates the optical signal to represent the data. (E.g., '898 figure 2.) The specification and claims of these patents explain that the reverse process (i.e., demodulation) is performed to recover the data from the optical signal. (E.g., '898 figure 2, col. 5.) One skilled in the art reading these patents would recognize that this demodulation process is occurring and that the device to performs it is a demodulator.

VIII. "OTDR"
('327 claims 13, 24, 35, 39; '511 claims 8, 16; '898 claims 13, 25; '012 claims 1, 5, 9, 11, 16, 17)

41. As understood by one of ordinary skill in the art of optical communications as of the invention date of the asserted patents, an OTDR is an optical time-domain reflectometer, i.e.,

a device that can monitor an optical fiber by measuring the time for a light wave to reflect back from a potential fault in the optical fiber. (‘327 patent col. 2.) Discontinuities in an optical fiber cause light to reflect back in the direction that it came from. For example, light that reaches the end of a cable or that reaches a break or crack in the fiber will reflect off the surface of the end, break, or crack. As the name suggests, OTDRs measure the distance (“-ometer”) to such reflective surfaces in the fiber optical cable by measuring the time (“time-domain”) for a light wave (“optical”) sent down the cable to reflect back (“reflect-”) to the OTDR.

42. Nowhere do the patents or their file histories offer a specific definition of “OTDR” beyond “optical time-domain reflectometer” or act as a lexicographer for that term. Nowhere do the patents or their file histories disclaim certain types of OTDR or limit that term to specific types of OTDR.

43. The various requirements that defendants add to their proposed construction, such as “non-data bearing, discrete . . . pulses” or a “separate” and “dedicated” transmitter and receiver, would effectively limit the term to a preferred example from the specifications: “Preferably, the OTDR operates at a wavelength that is different than the wavelength used for data transmission . . . . By operating the OTDR at a wavelength different than the wavelength used for data transmission, the OTDR may be allowed to continuously operating without disruption of the data traffic.” (‘898 patent col. 2.) These are simply “preferred” characteristics of the OTDR in these patents, and would not be understood by one skilled in the art to define or limit what an OTDR is.

IX. “Line Card”
(‘012 claims 9, 11-17)

44. To one skilled in the art at the time of the invention of the asserted patents, the term “line card” had a straightforward plain and ordinary meaning, encompassing any printed

circuit board that has the function of dealing with a line of a telecommunications system, whether that card contained a transceiver or not. For example, in the early days of telecommunications, it was common to use separate transmitters and receivers, rather than combining the two functions into a "transceiver" on a single circuit board. Accordingly, a line card known in the art might contain just a transmitter or just a receiver, or it might contain devices other than transmitters or receivers.

45. Nowhere do the patents or their file histories offer a specific definition of "line card" or act as a lexicographer for that term. To the contrary, the patentee stated in the file history that "the term 'line card' is exceedingly well known in the telecommunications industry." ('012 Proposed Amendment, March 30, 2016 at 10.)

46. Nowhere do the patents or their file histories disclaim line cards that do not contain transceivers. Rather, the file history says that the well-known term "line card" "is clearly applicable to the transceiver cards described in the specification." (*Id.*) In other words, the file history says that the transceiver cards in the specification are examples of line cards, not that all line cards are necessarily transceiver cards.

47. Because the plain and ordinary meaning of line card is exactly consistent with the intrinsic and extrinsic evidence, it would not be accurate to construe "line card" more narrowly than this plain and ordinary meaning by requiring that a line card have a transceiver.

X. "Tap" / "Tapping" / "Tapped" *('012 claims 1, 3, 5, 12, 13, 16, 17)*

48. "Tap" and its grammatical variations ("tapping" and "tapped") were common terms used in the field of optical communications at the time of the invention of the asserted patents. They have (and had at the time of the invention) a plain and ordinary meaning of removing or extracting a portion of a signal from an optical fiber or other communications route.

Nothing in this plain and ordinary meaning excludes the possibility of modulating or otherwise changing other characteristics of the light wave while the phase modulation is occurring. The dictionary definitions of "tap" reflect and are entirely consistent with this plain and ordinary meaning. (M. Weik, FIBER OPTICS STANDARD DICTIONARY, (Chapman & Hall 3rd ed. 1997), at 1002.)

49. The asserted patents' use of these terms is no different from the plain and ordinary meaning. Nowhere do any of the patents or their file histories offer a different definition of these terms or act as a lexicographer for these terms. Nowhere do the patents or their file histories disclaim any part of the plain and ordinary meaning of these terms.

50. The defendants' proposed construction seeks to narrow the meaning of "tap" in two ways: (1) it requires that the tap be an "illicit breach," and (2) it requires that the tap be of an optical fiber that "connects a transmitter with a receiver." The requirement that a tap be an "illicit breach" is inconsistent with the plain and ordinary meaning of the term. For example, the FIBER OPTICS STANDARD DICTIONARY definition expressly states that the tap may be "with or without authorization." (M. Weik, FIBER OPTICS STANDARD DICTIONARY, (Chapman & Hall 3rd ed. 1997), at 1002.) This is consistent with the everyday common usage of "tap," as in when police "tap" a suspect's phone lines. A police tap, conducted pursuant to a lawful warrant, is not an "illicit breach." It is also consistent with the everyday common usage of "tap," referring to a faucet or spigot, which by design and lawfully removes a small quantity of a liquid from a larger flow or container of the liquid. Likewise, the plain and ordinary meaning of "tap" covers taps that occur in places other than "an optical fiber that connects a transmitter with a receiver."

51. I understand that there is a presumption that the claims of a patent should be construed to each cover at least one of the embodiments disclosed in the specification of the patent. A person skilled in the art would understand that defendants' proposed construction fails to do so. For example, claim 1 of the '012 patent requires "tapping the data optical signal to produce a tapped optical signal" and "processing the tapped optical signal to produce an electrical signal indicative of a power of the data optical signal." In the embodiment shown in figures 2 and 3, the "tapping the data optical signal to produce a tapped optical signal" occurs within the coupler/splitter **31**. Identifying the coupler/splitter as the "tap" is consistent with the plain meaning of "tap," as shown in the FIBER OPTICS STANDARD DICTIONARY definition which states that "[e]xamples of taps are "branches, ***couplers***, and induction coils." (M. Weik, FIBER OPTICS STANDARD DICTIONARY, (Chapman & Hall 3rd ed. 1997), at 1002.) The "processing the tapped optical signal to produce an electrical signal . . ." occurs within the energy level or tap detector **33**. This "tap" in figures 2 and 3 is a component of the receiver itself. It is neither "illicit" nor on the connection between the transmitter and receiver, as the defendants' proposed construction requires.

52. As explained above, the intrinsic and extrinsic evidence is all consistent with the plain and ordinary meaning of "tap" and the related terms. However, if an explicit construction of these terms were required, it would not be consistent with the intrinsic and extrinsic record to require that the "tap" be an "illicit breach" or that it be located on the optical fiber that "connects a transmitter with a receiver."

XI. "Arm"
('816 claims 1, 19; '952 claims 1, 4, 11, 13)

53. To one skilled in the art at the time of the invention of the asserted patents, the term "arm" had a straightforward plain and ordinary meaning. There is no indication in the

specification of the asserted patents that it is being used in a manner inconsistent with its plain and ordinary meaning that would cause confusion. The patentee was not acting as his own lexicographer because the term “arm” is used according to its plain and ordinary meaning, rather than according to a different meaning contrived by the patentee. Therefore, there is no basis for giving the term a construction that is narrower than its plain and ordinary meaning.

54. “Arm” is used in the ’816 Patent specification, for example, in the context of an interferometer. Interferometers at the time of the effective filing date of the ’816 Patent (and for decades before then) basically had optics to split light into two paths and optics to recombine the light that had traveled the two paths. To a person of ordinary skill in the art, each of the alternate paths the light travels is known as an “arm.” Even Defendants concede that a “path” is essentially the same as an “arm,” as their proposed construction for “path” refers back to their proposed construction for “arm.”

55. A type of interferometer know at the time of the invention is a thin film filter, which is made from free space filters aligned to provide interferometric functions. In this type of interferometer, the arm is not formed from a waveguide, such as a fiber, but rather is part of the free space connection between filters. It was common to find thin film filters in transmitter and transceiver modules at the time of the effective filing date of the ’816 Patent.

56. Defendants’ proposed construction imports limitations that are not required by the plain and ordinary meaning of the term “arm.” Defendants’ requirement of a “fiber” is inconsistent with both the plain and ordinary meaning of “arm,” and with the claim language. As discussed above, an arm in an interferometer does not have to traverse a fiber, as in the case of a thin film filter-based interferometer. Second, Claims 1 and 19 recite a “fiber arm,” thus demonstrating that the term “arm” in itself does not connote having a fiber.

57. Defendants' proposed construction also requires a splitter and a coupler. This is inconsistent with the plain and ordinary meaning of "arm." The arms of an interferometer are located between a splitter and a coupler, but do not include the splitter and coupler.

58. This term should be construed the same for the '952 Patent.

XII. "Path Length Difference"
('055 claims 1, 9, 27)

59. To one skilled in the art at the time of the invention of the asserted patents, the term "path length" had a straightforward plain and ordinary meaning. There is no indication in the specification of the asserted patents that it is being used in a manner inconsistent with its plain and ordinary meaning that would cause confusion. Furthermore, "difference" had a commonly understood plain and ordinary meaning to persons of ordinary skill in the art, and there is no indication in the specification of the asserted patents that it is being used in a manner inconsistent with its plain and ordinary meaning that would cause confusion.

60. The patentee was not acting as his own lexicographer because the term "path length difference" is used according to its plain and ordinary meaning, rather than according to a different meaning contrived by the patentee. Therefore, there is no basis for giving the term a construction that is narrower than its plain and ordinary meaning.

61. Accordingly, if the term were to be construed, a "path length difference" would simply be the difference of two "path lengths," or the "difference in the length of the path" of two paths. The word "difference" is not being used in a specialized manner. For example, the specification refers to "the path length difference between the first path length and second path length." '055 Patent, Col. 3.

62. One of ordinary skill in the art at the time of the effective filing date of the '055 Patent would have understood that a "path length" refers to an optical path through a medium,

which could be vacuum, a gas, a liquid, or a solid material. For example, it would be understood that in a medium of constant refractive index, n, the path length would be a product of the geometrical distance (or physical length) and the refractive index. If n is a function of position along the geometrical path, the optical path length is the integral of nds, where ds is an element of length along the path. One of ordinary skill in the art would similarly understand that a difference in optical path length can be created by sending two beams of light through different media with, for example, a different index of refraction. Although the physical length of the path may be the same, the optical length will differ based on the difference in the index of refraction of the two media. This was a common technique known to one of ordinary skill in the art for making economical use of limited space when using a different physical path length would require too much room.

63. "Path length difference" is used in the '055 Patent specification in the context of an interferometer. As discussed above, interferometers had optics to split light into two paths and optics to recombine the light that has traveled the two paths. The "path length difference between the first path length and second path length" ('055 Patent, Col. 3) uses the plain and ordinary meaning of "path length difference."

64. Defendants' proposed construction imports limitations that are not required by the plain and ordinary meaning of the term "path length difference." The only difference between Oyster's proposed construction and Defendants' proposed construction is Defendants' use of "physical" to modify "length of the path." As discussed above, path length differences can be created by selection optical properties of the media through which two beams traverse to create and difference in the optical path length even if there is no difference in the physical path length.

Therefore, Defendants' proposal to incorporate a "physical" path length into the construction of this term is inconsistent with the plain and ordinary meaning.

65. Defendants are incorporating one embodiment, e.g. at Col. 3, in which the physical distance of the path through a fiber is the cause of delay for one light beam. The plain and ordinary meaning of "path length difference" is broader than Defendants' proposal.

XIII. "Path"
('055 claims 1, 2, 9, 10, 11, 14, 19, 22, 27)

66. "Path" is used in the patents-in-suit to indicate an arm of an interferometer, and thus should be construed in a manner consistent with the discussion of "arm."

XIV. "Output for Altering the Phase of the Phase Modulator"
('952 claim 1)

67. To one skilled in the art at the time of the invention of the asserted patents, the term "output for altering the phase of the phase modulator" had a straightforward plain and ordinary meaning. The term includes words that were commonly used by persons of ordinary skill in the art at the time of the invention, and together form a phrase that would be understood according to the ordinary meaning of those words. There is no indication in the specification of the asserted patents that the words in this phrase are being used in a manner inconsistent with their plain and ordinary meaning that would cause confusion.

68. The patentee was not acting as his own lexicographer because the term "output for altering the phase of the phase modulator" is used according to its plain and ordinary meaning, rather than according to a different meaning contrived by the patentee. Therefore, there is no basis for giving the term a construction that is narrower than its plain and ordinary meaning.

69. Accordingly, if the term were to be construed, an “output for altering the phase of the phase modulator” would simply be a “converted signal used to alter the phase of light in the phase modulator.”

70. Oyster’s proposed construction is consistent with the specification. For example, the ’952 Patent states that “[d]epending on the controller output, phase modulator 16 either imparts a certain phase shift to the non-information bearing light to represent a binary zero or another certain degree phase shift (for example 180 degrees different from the first certain phase shift) on the light passing through phase modulator 16 to represent a binary one, thus creating an optical signal 22, which represents a stream of binary bits.” ’952 Patent, Col. 5. The description of “imparts a certain phase shift” means the phase of the phase modulator is altered. However, whether this constitutes a modulation depend on whether the output corresponds to a stream of binary bits. While in this particular embodiment it does, the claim language does not say modulate, and is therefore broader, referring to any alteration of the phase of the modulator.

71. The only difference between Oyster’s proposed construction and Defendants’ proposed construction Defendants’ use of the word “modulate” to rewrite the claim. “Modulate” only reflects one particular way to alter the phase of the phase modulator, but Defendants’ construction would eliminate all other ways of altering the phase of the phase modulator. For example, one skilled in the art could use a coherent phase driven transmitter circuits where a local oscillator is used to mix into the main signal. In that case one would alter the initial signal so that the coherent main signal matches with the local oscillator signal, but it would not be modulation of the signal for encoding data.

XV. "Phase-Compensation Circuit"
('952 claims 5, 13)

72. To one skilled in the art at the time of the invention of the asserted patents, the term "phase-compensation circuit" had a straightforward plain and ordinary meaning. There is no indication in the specification of the asserted patents that the words in this phrase being used in a manner inconsistent with their plain and ordinary meaning that would cause confusion.

73. The patentee was not acting as his own lexicographer because the term "phase-compensation circuit" is used according to its plain and ordinary meaning, rather than according to a different meaning contrived by the patentee. Therefore, there is no basis for giving the term a construction that is narrower than its plain and ordinary meaning.

74. Accordingly, if the term were to be construed, a "phase-compensation circuit" would simply be a "circuit that provides phase compensation."

75. Oyster's proposed construction is consistent with the specification. For example, the '952 Patent states that "[e]xact determination of the imparted phase shift difference can be made by sending a CW signal through the interferometer during construction, for example a signal representing zeros, and resplicing the fiber to adjust the phase imparted by one the of the paths until a zero voltage is output at the detector 38." '952 Patent, Col. 7. Then the '952 Patent explains that a phase compensation is a way to avoid the physical process just described: "However, it is also possible to avoid the physical work required to create a 180-degree phase shift in two ways: either by placing a phase-compensating phase modulator 310 in one arm of the interferometer 300, as shown in FIG. 9, or by a phase-compensation circuit 210 in the controller circuit 218, as shown in FIG. 6." '952 Patent, Col. 7. Oyster's proposed construction is consistent with the stated purpose of the phase-compensation circuit 210 described above.

76. However, "phase-compensation circuit 210" is just one embodiment. The specification says that "the phase-compensation circuit 210 may be used with an interferometer of any phase-difference." 952 Patent, Col. 8. Defendants interpret this language as a requirement that this particular embodiment of the phase-compensation circuit must be capable of being used with "an interferometer of any phase-difference," and their proposed construction imports that limitation into the claims.

77. First of all, even if this embodiment were truly limited in the manner Defendants appear to believe it is, importing its limitations into the construction of the term would be improper, because its plain and ordinary meaning is broader. Second, Defendants are misinterpreting the specification because one of ordinary skill in the art would understand that the specification is describing that a phase-compensation circuit that may be used with an interferometer of any phase-difference, meaning it is possible to construct a phase-compensation circuit that is operable with any phase difference, not that one phase-compensation circuit must be operable with any phase difference. Defendants' proposed construction effectively reads the word "must" into the claim term by requiring operability with "any phase-difference."

XVI. "The Second Arm Being Longer Than the First Arm" *('952 claims 1, 13)*

78. The discussion of "path length difference" in connection with the '055 Patent is applicable to this term. Defendants' proposed construction incorrectly incorporates a "physical" path length, which is incorrect for the reasons discussed above. In light of the constructions of "arm" and "path length difference" discussed above, "second arm being longer than the first arm" would not need to be construed separately.

XVII. "The Optical Signals"
('327 claims 1, 14, 25, 36)

79. From the perspective of a POSITA, the normal function of transceivers is to send optical signals to other, distanced transceivers with receive functions to convey information. The '327 patent uses the term "transceiver" in this same sense. It teaches the use of a fiber optic transceiver with both transmit and receive functions. The transmit signal is sent off of the transmitter via fiber 110, while a received optical signal from some other transceiver is received via fiber 111. The fibers are not connected together, in fact the fibers are independent of each other. One fiber is utilized for sending optical signals, while the other fiber receives signals from another transceiver. There is a system router that decides which optical signals go where, but all optical signals must reach to the router to figure out their destination.

80. In all embodiments of '327, including in particular Figures 2 and 3 and their corresponding specification descriptions, a POSITA would understand that the patent teaches that the transceiver is not receiving the same signal it is sending out. There is no connection drawn, nor there is any description of the transmitter optical signal going elsewhere other than out of the transceiver to a receiver in the optical network. A receiver in the optical network would be a different receiver than where the transmitted signal has been generated. Similarly, for the receiver, the '327 patent 'teaches that the received signal comes from another transceiver in the optical network.

81. Optical networks do not operate unless optical signals can convey information. Information is conveyed from one transceiver (with a transmit function) to anther transceiver (with receive function) physically located elsewhere in the optical network. All optical network engineers are aware of this.

82. A POSITA would interpret the '327 patent as an approach to conveying optical signals from one transceiver to another transceiver elsewhere. In other words, the signal output from the transmitter in a particular claimed transceiver does not get fed directly into the input of the receiver in the same transceiver. Requiring such an operation would be fundamentally the opposite overall purpose and operation of any transceiver used for telecommunications involving sending optical signals over a distance. Instead, the patent only teaches and claims transceivers that include transmitters that transmit optical signals to the input of a receiver in another transceiver.

83. The claim language itself also confirms this. The claims require:

a. a transmitter component that transmits over a first optical fiber certain optical signals as a function of its input data and a

b. receiver component that receives over a second, different optical fiber other, different optical signals as a function of its different input data

84. More specifically, one skilled in the art would understand that "the optical signals" in the claims are not exactly the same "optical signals" that are transmitted by the transmitter on the transceiver card. In each independent claim of the '327 patent (claims 1, 14, 25, 36), the "transmitter . . . transmit[s] data over the first optical fiber" by "transmitting optical signals." By contrast, "the optical signals" in the claims are measured by the energy level detector, optically connected between the receiver and the fiber input. That fiber input is connected to the "second optical fiber." It has no connection to the "first optical fiber," where the transmitter transmitted its "optical signals." Each independent claim of the '327 patent contains "a receiver optically connected to the fiber input for receiving data from the second optical fiber." Just as the transmitter on the transceiver card transmitted data over an optical

fiber by transmitting optical signals, anyone skilled in the art would understand that when data is received from an optical fiber, it is received in the form of optical signals. Thus, anyone skilled in the art would understand that there are—and must be—"optical signals" that are received over the second optical fiber and that have been transmitted by another device at the other end of that second optical fiber, outside of the transceiver card. These "optical signals" on the second optical fiber are distinct from any "optical signals" transmitted by the transceiver card over the first optical fiber.

85. In at least claims 1 and 14 of the '327 patent, the energy level detector that measures the energy level of "the optical signals" is optically connected between the receiver and the fiber input, meaning that this energy level detector receives a portion of the optical signals that arrive on the second optical fiber. Accordingly, any person skilled in the art would recognize that "the optical signals" that are being measured in the claims are optical signals received at the transceiver card over the second optical fiber, after having being transmitted by the device at the opposite end of that fiber. They are not optical signals that were transmitted over the first optical fiber by the transmitter of the transceiver card.

86. Contrasting and/or comparing the claims of the '327 patent with those of related patents, including the '511 patent and the '898 patent also confirms this reading. The '511 patent, for example, makes clear that "a further communications box" receives "the optical signals." This is the way the patent teaches the process.

87. Moreover, the file history of this patent does not compel any different result. In the file history, when the patentee refers to "the transmitted optical signals" being measured, it is referring to the fact they were transmitted by a transceiver device somewhere else.

88. I also note that during the prosecution of the ’327 patent, the inventor responded to an examiner rejection that was based in part on a reference called “Darcie.” The inventor explained that the Darcie reference concerned a diagnostic transmitter and receiver at a central office that one of ordinary skill in the art would understand is typical OTDR diagnostic equipment. (’327 Patent File History, Response to Office Action, dated Feb. 13, 2009, at 9.) The inventor explained that “Darcie does not measure an energy level of the optical signals for telecommunication as now claimed, but rather only those of a diagnostic signal.” (*Id*. at 10.) Thus, the file history underscores that the ’327 patent concerns optical signals in telecommunications, not a diagnostic-style device such as the one discussed in the context of the Darcie reference.

89. Read in light of the specification, a POSITA would understand the scope of the term “the optical signals” with more than reasonable certainty.

90. Any interpretation of the claims of the ’327 patent that requires that the output of the transmitter in any transceiver to be fed into the receiver of the same transceiver would exclude or read out each and every embodiment taught or described in the patent. Moreover, the ’327 patent does not teach or described this kind of loop back setup.

XVIII. “Means for Phase Modulating Light as a Function of an Input Electronic Data Stream and a Second Electronic Data Stream Having a Delay, Thus Creating a Phase-Modulated Optical Signal with Encoded Information for Recovery” *(‘055 claim 27)*

91. The parties agree that this is a means-plus-function term and that the function is “phase modulating light as a function of an input electronic data stream and a second electronic data stream having a delay, thus creating a phase-modulated optical signal with encoded information for recovery.” The parties agree that the corresponding structure can be found in

figures 1 and 2 (and in corresponding portions of the specification), but they disagree on precisely what portions of these figures constitute the corresponding structure.

92. In figure 2 of the '055 patent, the "input electronic data stream" is labeled "DSI." The "second electronic data stream having a delay" is labeled **119**. These two data streams are the two inputs to the exclusive-OR gate **118**, which applies the exclusive-OR function to the two inputs, to produce the output labeled "OP." This output OP is sent to—and controls—the phase modulator **16**. (Figure 1; column 5.) Accordingly, the light is phase modulated (by modulator **16**) as a function (exclusive-OR) of the two inputs to exclusive-OR gate **118**. One skilled in the art would recognize that the claimed function of modulating light as a function of the two inputs and thus creating a phase-modulated optical signal with encoded information for recovery is performed by the two components exclusive-OR gate **118** and phase modulator **16**.

93. Defendants propose a structure that includes additional components that are unrelated to this claimed function. In particular, defendants propose that the structure includes the entire controller **18**. Controller **18** includes the exclusive-OR gate **118** (figure 2; column 2), but it also contains components that perform unrelated functions. As shown in figure 1, the controller controls not just the phase modulator **16**, but also the laser **12**. As the specification explains, the controller may be a PLC (programmable logical controller—essentially a miniature computer) and be programmable to control the optical power output of the laser in a way that depends upon the bit error rate of given optical span. ('055 patent, column 4.)

94. These other components of the controller involved in controlling the laser power are not involved in performing the function of phase modulating light as a function of the two data streams. One skilled in the art would understand that these other components of the

controller are not a part of the structure corresponding to the "means for phase modulating term." Rather, that structure is the exclusive-OR gate and the phase modulator.

XIX. "Means for Receiving the Optical Signal from the Transporting Means" *('055 claim 27)*

95. The parties agree that this is a means-plus-function term and that the function is "receiving the optical signal from the transporting means."

96. I understand that there is a disagreement with respect to the corresponding structures. I agree with Oyster's proposed construction. For the function "receiving the optical signal from the transporting means," two structures performing this function are discussed in the specification. First, in Column 2 the specification describes a receiver that "includes a splitter for splitting the optical signal into a first path and a second path. The second path has a second path length longer than the first path length, the second path length being a function of the delay in the second electronic data stream." This is the basic structure of an interferometer discussed above, with an additional requirement that the path length of a second arm is a function of the delay in the second electronic data stream. Notably, this description in the specification does not include a "delay fiber." These structures are sufficient to reform the receiving function, and therefore constitute a complete disclosure of a corresponding structure for the "means for receiving."

97. A second corresponding structure is disclosed in Columns 5 and 6, where the specification describes a specific embodiment of receiving interferometer that performs the recited function. The specification describes receiver 30 as including an interferometer 40 with a path length difference introduced by delay fiber 46 whose length is chosen to allow the system to recover data in the transmitted signal by undoing the effects of a delay electronically introduced by the controller of the phase modulator. These structures are sufficient to reform the receiving

function, and therefore constitute a complete disclosure of a corresponding structure for the "means for receiving."

98. Defendants' proposed corresponding structure is incorrect. The Defendants include a delay fiber as part of the corresponding structure. This component is not necessary for performing the receiving function and does not appear in one of the embodiments discussed above.

I declare under penalty of perjury that the foregoing is true and correct. Executed September 15, 2017.

By:______________________________

Dr. Michael Lebby